Patent Claims

1. A flow passage (1), through which a medium can flow in a direction of flow P, of a heat exchanger having two heat exchanger surfaces (F1, F2), which lie substantially opposite one another, are in particular arranged parallel and/or at a spacing of a passage height H and each have a structure formed from a multiplicity of structure elements that are arranged next to one another in rows transversely with respect to the direction of flow P and project into the flow passage, the structure elements each having a width B, a length L, a height h, a flow-off angle α and a longitudinal axis, characterized in that at least two rows (17, 18, 19, 20) comprising structure elements (13, 13') on substantially opposite heat exchanger surfaces (F1, F2) have an overlap (Ü) with one another.

2. The flow passage as claimed in claim 1, characterized in that the overlap (Ü) is 100%.

3. The flow passage as claimed in claim 1, characterized in that at least one structure element (13) is elongate, in particular rectangular in form and has a straight longitudinal axis (13a).

4. The flow passage as claimed in claim 1, characterized in that at least one structure element (14) is elongate and angled in form and has an angled longitudinal axis (14a, 14b) which forms the flow-off angle α and a flow-on angle β with the direction of flow P.

5. The flow passage as claimed in claim 1, characterized in that at least one structure element (15) is arcuate in form and has a longitudinal axis (15a) which is curved with a radius R and forms the flow-off angle (α) and a flow-on angle β with the

direction of flow P.

6. The flow passage as claimed in claim 1, characterized in that at least one structure element (16) is approximately Z-shaped in form and has a doubly curved longitudinal axis (16a) with radii (R1, R2) which forms the flow-off angle α and a flow-on angle β with the direction of flow P.

7. The flow passage as claimed in claim 1, characterized in that at least one structure element (43) is V-shaped in form and has straight V limbs (43a, 43b).

8. The flow passage as claimed in claim 1, characterized in that at least one structure element (44) is V-shaped in form and has V limbs (44a, 44b) which are curved away from the direction of flow.

9. The flow passage as claimed in one of claims 1 to 8, characterized in that the height h of at least one of the structure elements (13, 14, 15, 16) is 20% to 50% of the passage height H.

10. The flow passage as claimed in claim 9, characterized in that the length L of at least one structure element (13, 14, 15, 16) is from two to twelve times the height h of the structure element.

11. The flow passage as claimed in one of claims 1 to 10, characterized in that the distance s between the rows amounts to 0.5 to eight times the depth T.

12. The flow passage as claimed in one of claims 1 to 11, characterized in that the distance s between in each case two rows varies in the direction of flow P.

13. The flow passage as claimed in one of claims 1 to

10, characterized in that at least one structure element (13, 14, 15, 16) has a constant width B in the range from 0.1 to 6.0 mm, preferably in the range from 0.1 to 3.0 mm.

14. The flow passage as claimed in one of claims 1 to 10, characterized in that at least one structure element (13, 14, 15, 16) has a width which increases in the direction of flow between a starting width B1 and a finishing width B2, the starting width B1 being in the range from 0.1 to 4 mm and the finishing width B2 being in the range from 0.1 to 6 mm.

15. The flow passage as claimed in one of the preceding claims, characterized in that the flow-off angle α is in the range from 20 to 70°, preferably in the range from 40 to 65°, and in particular has a value of from 50 to 60°.

16. The flow passage as claimed in one of claims 4 to 6 and 15, characterized in that the flow-on angle β is in each case larger than the flow-off angle α.

17. The flow passage as claimed in claim 6, characterized in that the radius R is in the range from 1 to 10 mm, preferably in the range from 1 to 5 mm.

18. The flow passage as claimed in claims 5 and 17, characterized in that the radii R1 and R2 are equal to the radius R.

19. The flow passage as claimed in one of claims 1 to 18, characterized in that a row (17, 18, 19, 20) in each case has identical structure elements (13, 13').

20. The flow passage as claimed in one of claims 1 to 18, characterized in that a row in each case has different structure elements.

21. The flow passage as claimed in claim 19, characterized in that individual structure elements (13, 14, 15, 16) are arranged next to one another in pairs (32, 33, 34, 35) at a distance a and in mirror-image fashion with respect to one another.

22. The flow passage as claimed in claim 19, characterized in that some or all the structure elements (13, 14, 15, 16) are parallel but offset with respect to one another and are arranged in pairs (36, 37, 38, 39) at a distance a transversely with respect to the direction of flow.

23. The flow passage as claimed in claim 21 or 22, characterized in that a distance a between two structure elements may vary within at least one row.

24. The flow passage as claimed in claim 21 or 22, characterized in that the distance a is in the range from 0 to 8 mm.

25. The flow passage as claimed in claim 19, 21, 22 or 24, characterized in that individual structure elements (13) of a row (40) are offset by an amount f with respect to one another in the direction of flow P, the amount f being less than the depth T of the structure elements (13), and T being the projection of the length L transversely with respect to the direction of flow P.

26. The flow passage as claimed in claim 22 or 25, characterized in that individual structure elements (13) of a row (41) are not arranged parallel and have a differing flow-off angle α.

27. The flow passage as claimed in claim 22, 25 or 26, characterized in that individual structure elements (13) of a row (42) have different lengths L1, L2.

28. The flow passage as claimed in one of the preceding claims, characterized in that opposite rows (17, 18, 19, 20) have an offset f in the direction of flow P, f being less than the depth T of a row (17, 19).

29. The flow passage as claimed in one of the preceding claims, characterized in that some or all the structure elements (13, 13') of rows (17, 18, 19, 20, 21, 22) lying opposite one another are oppositely oriented, in particular have an opposite flow-off angle α.

30. The flow passage as claimed in one of the preceding claims, characterized in that the rows (23, 24) lying opposite one another have voids (25, 26, 27) between the structure elements (13), with structure elements (13') of the other row in each case lying opposite these voids.

31. The flow passage as claimed in one of the preceding claims, characterized in that the structure elements of opposite rows touch one another, in particular are joined to one another by welding or soldering.

32. The flow passage as claimed in one of the preceding claims, characterized in that opposite rows of structure elements have the same depth T in the direction of flow P.

33. The flow passage as claimed in one of the preceding claims, characterized in that opposite rows of structure elements have different depths T1, T2 in the direction of flow P.

34. The flow passage as claimed in one of the

preceding claims, characterized in that the heat exchange surfaces which lie substantially opposite one another, and in particular the structure elements arranged thereon, are curved.

35. The flow passage as claimed in one of the preceding claims, characterized in that the heat exchange surfaces which lie substantially opposite one another are heat-engineering primary surfaces or secondary surfaces, the secondary surfaces being formed in particular by fins, webs or the like which are preferably clamped, welded or soldered to the flow passage.

36. The flow passage as claimed in one of the preceding claims, characterized in that the height h is in the range from 2 mm to 10 mm, in particular in the range from 3 mm to 4 mm, and is preferably around 3.7 mm.

37. The flow passage as claimed in one of the preceding claims, characterized in that the flow passage is rectangular and has a width b which is in particular in the range from 5 mm to 120 mm, preferably in the range from 10 mm to 50 mm.

38. The flow passage as claimed in one of the preceding claims, characterized in that a hydraulic diameter of the flow passage is in the range from 3 mm to 26 mm, in particular in the range from 3 mm to 10 mm.

39. The flow passage as claimed in one of the preceding claims, characterized in that at least one, in particular each row of structure elements comprises in each case a plurality of structure elements.

40. A heat exchanger, in particular an exhaust-gas

cooler, in particular for a motor vehicle, having flow passages for a fluid, characterized in that at least one flow passage is designed as described in one of the preceding claims.

41. The heat exchanger as claimed in claim 39, characterized in that the flow passages (1) are formed as soldered or welded flat or rectangular tubes (7) and the heat exchanger surfaces (F1, F2) are formed as flat tube walls.

42. The heat exchanger as claimed in one of the preceding claims, characterized in that the flow passages are formed by stacking plates or disks which have structure elements on top of one another.

43. The heat exchanger as claimed in one of the preceding claims, characterized in that the structure elements (10, 11) are formed into the tube walls (F1, F2), in particular by stamping.

44. The heat exchanger as claimed in one of the preceding claims, characterized in that exhaust gas can flow through the tubes (7) and a liquid coolant can flow around the tubes (7).

45. The heat exchanger as claimed in one of the preceding claims, characterized in that the rows (8, 9) of structure elements (10, 11) are at a distance s from one another in the direction of flow (7a) which amounts to two to six times the length L of a structure element.

46. The heat exchanger as claimed in one of the preceding claims, characterized in that between the rows with structure elements (fluid 1) there are further rows with structure elements which project outward into fluid 2.

47. The heat exchanger as claimed in claim 45, characterized in that the outwardly projecting structure elements are supporting studs, webs or elements and touch one another or are welded or soldered to one another.

48. The heat exchanger as claimed in claim 45 or 46, characterized in that the outwardly projecting structure elements contribute to improving the heat transfer.